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A Study of Selected Aspects of State Control of Radiation Hazards

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A Study of Selected Aspects of State Control of Radiation Hazards

(As of 1969)

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Bureau of Radiological Health
Rockville, Maryland 20852

FOREWORD

This report is one of a series of eight Bureau of Radiological Health staff documents used in the preparation of the "Report to the Congress on Studies Conducted Pursuant to Section 357 of the Radiation Control for Health and Safety Act of 1968, Public Law 90-602." A number of projects were established to study and report on various aspects of radiation control.

The Bureau of Radiological Health, formerly the National Center for Radiological Health, carries out a continuing national program designed to reduce the exposure of man to hazardous ionizing and nonionizing radiation.

The Bureau publishes its findings monthly in Radiological Health Data and Reports, Public Health Service numbered publications, appropriate scientific journals, and technical report series for the Bureau's divisions, offices, and laboratories.

The technical reports series allows comprehensive and rapid publishing of the results of intramural and contractor projects. The reports are distributed to State and local radiological health program personnel, Bureau technical staff, Bureau advisory committee members, university radiation safety officers, libraries and information services, industry, hospitals, laboratories, schools, the press, and other interested individuals. These reports are also included in the collections of the Library of Congress and the National Technical Information Service.

I encourage the readers of these reports to inform the Bureau of any omissions or errors. Your additional comments or requests for further information are also solicited.

John C. Villforth
Director
Bureau of Radiological Health

PREFACE

Section 357 of the Radiation Control for Health and Safety Act of 1968, Public Law 90-602, requires the conduct of studies including a determination of gaps and inconsistencies in Federal and State control of radiation sources. This report on a study of certain aspects of State control programs for ionizing and nonionizing radiation was conducted in partial fulfillment of these requirements.

The study objective was primarily to deliniate gaps and inconsistencies in State control of radiation rather than program strengths.

Our appreciation is extended to the State and local agencies whose assistance made the conduct of this study possible.

James W. Miller, D.D.S.
Director
Office of Regional Operations

CONTENTS

Page

FOREWORD iii

PREFACE v

ABSTRACT xi

INTRODUCTION 1

METHODS AND PROCEDURE 2

FINDINGS 2

- Regulatory Authority 2
- Compliance 3
- Manpower 7
- Funds 13
- Training 23
- Instrumentation 30

CONCLUSIONS 32

- Regulatory Authority 32
- Compliance 32
- Manpower 34
- Funds 34
- Training 35
- Instrumentation 36

APPENDIX A:
- State Radiation Control Program Questionnaire 37

APPENDIX B:
- Guidelines for Determining the Present Status, Gaps, and Inconsistencies in State Radiation Control Programs 69

TABLES

1. Distribution of States with licensed or registered radiation facilities, by type of facility and percent range, Fiscal Year 1969 4

2. Distribution of States that have conducted initial surveys of radiation facilities, by type of facility and percent range, Fiscal Year 1969 5

3. Distribution of States that have resurveyed radiation facilities, by type of facility and percent range, Fiscal Year 1969 6

Page

4. Compliance status of medical and dental X-ray machines as of July 1968 8
5. Distribution of States by percent of total medical X-ray machines in compliance, Fiscal Year 1968 9
6. Distribution of States by percent of total dental X-ray machines in compliance, Fiscal Year 1968 10
7. Total man-equivalents in State radiation control programs, Fiscal Years 1962–1969 11
8. Distribution of States by man-equivalents per million population, Fiscal Year 1969 12
9. Man-equivalents per million population for Agreement and Non-Agreement States, Fiscal Year 1969..... 14
10. Distribution of Agreement and Non-Agreement States by man-equivalents per million population, Fiscal Year 1969 15
11. Adequacy of manpower in States by selected radiation control program areas, Fiscal Year 1969 16
12. State radiological health professional personnel needs by program area, Fiscal Year 1969 17
13. Total expenditures for State radiation control programs by year, Fiscal Years 1962 through 1969..... 19
14. Total expenditures for State and local radiological health activities by program area, Fiscal Years 1962 to 1969 20
15. Expenditures for Agreement and Non-Agreement States, Fiscal Year 1969 21
16. Distribution of Agreement and Non-Agreement States by cents per capita, Fiscal Year 1969 22
17. Radiological health expenditures in States by per capita and total population, Fiscal Year 1969 24
18. Number of personnel with advanced degrees in States, Fiscal Year 1969 25
19. Distribution of States by selected man-weeks of radiological health courses completed by present staff as of June 30, 1969 26
20. Distribution of the number of States in man-weeks ranges of radiological health training courses per million population, as of June 30, 1969 28

Page

21. Number of States with personnel completing training courses in selected areas as of June 30, 1969..... 29

22. Number of States requiring licensing, certification, or training for X-ray machine operators, Fiscal Year 1969..... 29

23. Number of States with radiation survey instruments available for use and with adequate number of survey instruments by type of radiation, Fiscal Year 1969..... 31

24. Number of States with radiation detection instrumentation available for use and with adequate number of instruments by type of instruments, Fiscal Year 1969..... 33

ABSTRACT

A study was made of selected aspects of State control of radiation. This report presents information designed to identify gaps and inconsistencies in the control programs and provides information that may be utilized to strengthen and improve the effectiveness of State control of health hazards from radiation sources.

A STUDY OF SELECTED ASPECTS OF STATE CONTROL OF RADIATION HAZARDS

INTRODUCTION

The Radiation Control for Health and Safety Act of 1968, Public Law 90-602, provides for the protection of the public health and safety from electronic product radiation. Section 357 of the Act requires the Secretary of the Department of Health, Education, and Welfare, to conduct studies of both State and Federal control of radiation hazards. A report of the results of such studies are to be made to Congress on or before January 1, 1970, together with recommendations for legislation as may be appropriate.

This study details current State regulatory authority, resources, and control programs for ionizing and nonionizing radiation from electronic products and other types of ionizing radiation. Statistical and narrative radiation control data are presented for the collective States.[1]

The study has the following objectives:

A. To determine the present status of radiation control programs of the collective States;

B. To determine any gaps and inconsistencies in present State control of health hazards from electronic products emitting ionizing and nonionizing radiation and other types of ionizing radiation;

C. To recommend measures to assure consistent and effective control of health hazards from radiation sources; and

D. To recommend measures to strengthen State radiological health programs.

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[1]Unless stated otherwise, "States," as used in this report, includes the 50 States, Puerto Rico, the District of Columbia, New York City, and New York Labor Department.

METHOD AND PROCEDURE

The study was planned and conducted by the Bureau of Radiological Health and its nine regional representatives with the cooperation of the States. The study consisted of: (1) development of guidelines to determine State radiation control program needs, (2) development of a questionnaire for use in obtaining information on State control of radiation, (3) completion of the questionnaire by each of the States, the District of Columbia, Puerto Rico, New York Department of Labor and New York City Health Department, and (4) analysis of the data and writing the report.

FINDINGS

Regulatory Authority

The majority of State radiation control acts provide for comprehensive control of ionizing radiation, including registering sources and promulgating and enforcing regulations. In a few States, statutes are restricted to specified aspects of radiation control such as registering sources, requiring the reporting of radiation incidents, and permitting investigation of overexposure.

In general, the State statutes on radiation control apply to all professions and others using radiation sources. Three States, however, exempt by legislation certain professions and facilities from regulatory authority. Of the three States, one exempts the healing arts profession, another exempts hospitals and facilities licensed by the Medical Care Commission, and the third exempts chiropractors.

Forty-two States have passed enabling legislation empowering the governor to enter into an agreement with the Atomic Energy Commission for control of certain radioactive materials previously under the regulatory jurisdiction of the Atomic Energy Commission. Of the 42 States with enabling authority, 19, as of August 15, 1969, have concluded agreements with the AEC for transfer of this regulatory responsibility to the States, hereafter called "Agreement States."

Since sources of nonionizing radiation have only recently become a problem in terms of quantity, few States have acted to provide regulatory authority to control these sources of radiation. Only eight States have enacted specific statutes for regulatory authority over nonionizing sources. Of these, five States have authority for comprehensive control of all nonionizing radiation sources while the authority

is limited to laser systems in the remaining three States. Although lacking specific regulatory authority, 23 States assume authority for control of nonionizing sources under the general authority of the health departments.

Compliance

To conduct an effective radiation control program, the States must register or license the sources of radiation, conduct surveys to determine whether or not the sources and facilities conform with appropriate regulations or acceptable standards, have the user correct any deficiencies, and conduct followup surveys to verify corrections. This is a formidable task because of the large number of sources. As an example, there were an estimated 109,000 medical X-ray and 98,000 dental X-ray machines as of Fiscal Year 1968.

A large number of States indicated that certain compliance data were not known or not available. Of the States providing information, the registration and licensing of radiation facilities vary widely. Two States, for example, have yet to register any X-ray machines used by physicians; 3 States, medical clinics; 11 States, osteopathic X-ray; and 6 States, accelerators. Some States have registered the majority of radiation facilities. Thirty-six States presently have registered 75 to 100 percent of physician X-ray; 21 States, accelerators; and 36 States have registered most of the hospital facilities (table 1).

Although surveys or inspections by the States do not prove compliance, they are indicative of radiation control activities. The number of States that have conducted initial surveys of radiation facilities shows considerable inconsistencies. Twenty-five States have conducted initial surveys of from 75 to 100 percent of the total physician X-ray facilities, but 9 States have conducted surveys of only 1 to 24 percent. For dental facilities, 27 of the States have performed furst surveys of from 75 to 100 percent of the total dental facilities (table 2).

Resurveys are further indicators of compliance activities by the States. These are complete reexaminations conducted after the first and followup surveys. Again the record of the States is widely varied, but far fewer States have conducted resurveys than the number conducting first surveys. To illustrate, only 6 States have resurveyed 75 to 100 percent of the physician X-ray machines, and only 8 States have resurveyed the same percentage of dental facilities. Six States have not conducted any resurveys of physician X-ray machines (table 3).

In Fiscal Year 1968, only 34 States provided sufficient data to determine the compliance status for medical X-ray machines. In these States, the majority of medical X-ray machines have been registered,

Table 1. Distribution of States with licensed or registered radiation facilities, by type of facility and percent range, Fiscal Year 1969

Percent Range	Number of States (Total 39) [a] — Type of Facility													
	Physician X-ray	Medical Clinic X-ray	Hospital X-ray	Dental X-ray	Chiropractic X-ray	Veterinary X-ray	Osteopathic X-ray	Podiatrist X-ray	Industrial Radiography X-ray	Other Industrial X-ray [b]	Accelerator	Laser	Microwave	Radium
0	2	3	2	2	2	3	11	5	3	11	6	24	24	2
1-24	-	-	-	-	-	-	-	-	1	-	-	-	-	-
25-49	-	-	1	-	-	-	-	-	1	-	1	-	-	-
50-74	1	1	-	-	1	1	-	1	1	1	2	-	-	1
75-100	35	25	36	37	35	34	22	32	32	11	21	1	-	29
Not Applicable	-	10	-	-	1	-	5	-	-	7	3	9	10	1
Unknown	-	-	-	-	-	1	1	1	1	9	6	5	5	6

[a] Data available in only 39 States. Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[b] X-ray gauges and analytical X-ray machines, for example.

Table 2. Distribution of States that have conducted initial surveys of radiation facilities, by type of facility and percent range, Fiscal Year 1969

Percent Range	Number of States (Total 39) [a]													
	Type of Facility													
	Physician X-ray	Medical Clinic X-ray	Hospital X-ray	Dental X-ray	Chiropractic X-ray	Veterinary X-ray	Osteopathic X-ray	Podiatrist X-ray	Industrial Radiography X-ray	Other Industrial X-ray [b]	Accelerator	Laser	Microwave	Radium
0	1	2	-	-	-	3	11	9	6	13	12	26	25	6
1-24	9	2	6	7	8	7	2	3	8	2	2	-	-	2
25-49	2	2	2	2	2	2	3	3	4	1	3	-	-	2
50-74	1	5	-	2	2	3	2	4	3	2	1	-	-	3
75-100	25	18	30	27	26	23	15	18	15	7	12	1	-	21
Not Applicable	-	9	-	-	-	-	5	-	-	7	4	8	9	1
Unknown	1	1	1	1	1	1	1	2	3	7	5	4	5	4

[a] Data available in only 39 States. Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[b] X-ray gauges and analytical X-ray machines, for example.

Table 3. Distribution of States that have resurveyed radiation facilities, by type of facility and percent range, Fiscal Year 1969

Percent Range	Number of States (Total 39) [a] — Type of Facility													
	Physician X-ray	Medical Clinic X-ray	Hospital X-ray	Dental X-ray	Chiropractic X-ray	Veterinary X-ray	Osteopathic X-ray	Podiatrist X-ray	Industrial Radiography X-ray	Other Industrial X-ray [b]	Accelerator	Laser	Microwave	Radium
0	12	11	10	8	15	19	21	20	20	17	20	28	27	13
1-24	11	8	6	11	10	9	5	6	5	4	1	-	-	7
25-49	4	2	3	4	2	2	3	1	1	-	2	-	-	2
50-74	1	3	3	2	1	-	1	1	2	-	3	-	-	-
75-100	6	2	12	8	6	5	2	5	8	5	5	-	-	12
Not Applicable	-	9	-	-	-	-	5	-	-	7	4	8	9	1
Unknown	5	4	5	6	5	4	2	6	3	6	4	3	3	4

[a] Data available in only 39 States. Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[b] X-ray gauges and analytical X-ray machines, for example.

78 percent have been surveyed, and 65.7 percent of the estimated total machines are in compliance with regulations or accepted standards. Fiscal Year 1968 national compliance data are available for dental X-ray machines in 38 States. In these 38 States, 85 percent of the estimated total number of dental machines have been registered and inspected. Seventy-eight percent of the estimated total machines are in compliance with regulations or acceptable standards (table 4).

There are important differences in the number of States that have certain percentages of medical X-ray machines in compliance. There are 3 States, for example, that have less than 10 percent of the medical X-ray machines in compliance, while 5 States have over 90 percent in compliance. Seventeen States have under 50 percent of the medical X-ray machines in compliance and only 11 States have 80 percent or more in compliance (table 5).

Compliance among the States for dental machines also varies over a wide range, but more States have a higher percentage of dental X-ray machines in compliance than medical X-ray machines. Only 3 States have under 10 percent of dental machines in compliance compared with 18 that have 90 percent or more im compliance. Nine States have under 50 percent of the dental machines in compliance, and 25 States have 80 percent or more in compliance (table 6).

Manpower

The State radiation control programs had a total of 237 man-equivalents in 1962. Substantial yearly increases in numbers of personnel occurred from 1962 to 1965 with slight additional increases in 1966 and 1967, for a total increase of 118 man-equivalents, or 88 percent over 6 consecutive years. A decrease in the number of State personnel in Fiscal Year 1969 reduced the manpower total from a peak of 445 to the current 437 man-equivalents. The present man-equivalents available in State radiation control programs are precisely the same as the 437 man-equivalents available in 1965 – four years past (table 7).

The 437 man-equivalents presently employed in the States are distributed unequally on a population basis. For example, five States have less less than one man-equivalent per million population, two have between five and six, and two other States have eight or more man-equivalents per million population. Thus, the States with the lowest man-equivalents differ by a factor of more than 3ight from those States with the highest man-equivalents per million population. To show other differences in available manpower, 22 States have less than 2 man-equivalents per million population, another 22 States from 2 to 3.9, and 8 States have from 4 to 8.9 man-equivalents per million population (table 8).

Table 4. Compliance status of medical and dental X-ray machines as of July 1968

Category	Medical X-ray machines[a,b]		Dental X-ray machines[b,c]	
	Number	Percent	Number	Percent
Estimated machines	89,318		87,522	
Total registered	83,541	93.5	75,077	85.8
Total inspected	69,882	78.2	74,090	84.7
Total in compliance	58,670	65.7	68,650	78.4

[a]Data available in only 34 States.

[b]Data from New York City Departments of Health and New York Department of Labor have been included with New York State Department of Health.

[c]Data available in only 38 States.

Table 5. Distribution of States by percent of total medical X-ray machines in compliance, Fiscal Year 1968

Percent of Medical X-ray Machines in Compliance	State[a]	
	Number	Percent of Distribution
Total	52	100.0
Under 10.0	3	5.8
10.0 - 19.9	3	5.8
20.0 - 29.9	5	9.6
30.0 - 39.9	4	7.7
40.0 - 49.9	2	3.8
50.0 - 59.9	3	5.8
60.0 - 69.9	1	1.9
70.0 - 79.9	4	7.7
80.0 - 89.9	6	11.5
90.0 and over	5	9.6
Not available	16	30.8

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Table 6. Distribution of States by percent of total dental X-ray machines in compliance, Fiscal Year 1968

Percent of Dental X-ray Machines in Compliance	State[a]	
	Number	Percent of Distribution
Total	52	100.0
Under 10.0	3	5.8
10.0 - 19.9	2	3.8
20.0 - 29.9	2	3.8
30.0 - 39.9	-	-
40.0 - 49.9	2	3.8
50.0 - 59.9	3	5.8
60.0 - 69.9	1	1.9
70.0 - 79.9	5	9.6
80.0 - 89.9	7	13.5
90.0 and over	18	34.7
Not available	9	17.3

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Table 7. Total man-equivalents in State radiation control programs[a]
Fiscal Years 1962–1969

Fiscal Year	1962	1963	1964	1965	1966	1967	1968[b]	1969[c]
Total man-equivalents	237	312	375	437	444	445	439	437

[a]PHS personnel on loan to States are excluded in each fiscal year except 1969, which includes five assignees.

[b]Excludes Connecticut.

[c]Excludes Virgin Islands.

NOTE: Fiscal years 1962 through 1967 figures represent 50 States plus the District of Columbia, Puerto Rico, and the Virgin Islands. Fiscal year 1968 figures represent 49 States (Connecticut excluded) plus the District of Columbia, Puerto Rico, and the Virgin Islands. Fiscal year 1969 figures represent 50 States plus the District of Columbia and Puerto Rico.

Table 8. Distribution of States by man-equivalents per million population, Fiscal Year 1969

Range: Man-equivalents per million population	Number of States[a]	Population[b] (thousands)	Total man-equivalent[c]
Total	52	202,557	437
Under 1.0	5	39,316	25
1.0 - 1.9	17	68,847	93
2.0 - 2.9	15	60,963	153
3.0 - 3.9	7	6,939	23
4.0 - 4.9	4	5,853	25
5.0 - 5.9	2	19,128	105
6.0 - 6.9	-	-	-
7.0 - 7.9	-	-	-
8.0 and over	2	1,511	13

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[b]Total resident population, July 1968.

[c]Includes five PHS personnel on loan to States.

A disproportionately high number of man-equivalents is in the Agreement States. To illustrate, the Agreement States contain 45.7 percent of the nation's population and have 62.2 percent of the total man-equivalents. The non-Agreement States have only 37.8 percent of the manpower to serve 54.3 percent of the population. Thus, the Agreement States have almost twice the manpower of the non-Agreement States; 2.9 man-equivalents versus 1.5 man-equivalents per million population (table 9).

To further evaluate, the States have an average of 2.2 man-equivalents per million population. Twelve Agreement States, with 66 percent of Agreement State population, exceed the national average. The non-Agreement States are less adequately staffed. Eighteen non-Agreement States, serving 75 percent of the non-Agreement States population, have less than the national average (table 10).

This difference in manpower between Agreement and non-Agreement States is much larger than can be accounted for by the manpower used in Agreement States for the control of radioactive material licenses transferred from the Atomic Energy Commission. The Agreement States use 34 more man-equivalents than the non-Agreement States in the control of radioactive materials. This means that the Agreement States have 73 more man-equivalents than the non-Agreement States in radiation control programs other than radioactive materials. The States should have a certain minimum number of personnel to control radiation in each program area. Applying the manpower guidelines, 30 States have insufficient personnel to conduct a minimum control program for medical X-ray machines. Only 9 States have adequate numbers of personnel for non-medical X-ray sources, and only 21 have adequate personnel for radioactive materials. Forty of 52 States do not have a program to control nonionizing sources of radiation (table 11).

Based upon the guidelines and the estimated number of radiation sources by type, a national deficiency of 188 man-equivalents presently exists in State radiation control programs. The greatest need for additional manpower is for 74 man-equivalents in the non-medical X-ray programs, followed closely by the manpower needs for medical X-ray and nonionizing radiation control programs (table 12).

Funds

State radiation control programs spent a total of $2,621,200 in Fiscal Year 1962. Substantial yearly increases were made in total State expenditures from 1962 to 1967. After the highest yearly expenditure of $7,442,100 in 1967, State radiation control funds decreased in Fiscal Year 1968 and Fiscal Year 1969, resulting in an expenditure of

Table 9. Man-equivalents per million population for Agreement and Non-Agreement States, Fiscal Year 1969

Type of program	Population[a] (thousands)		Man-equivalent[b]		Man-equivalents per million population
	Number	Percent	Number	Percent	
Total[c]	202,557	100.0	437	100.0	2.2
Agreement States[d]	92,607	45.7	272	62.2	2.9
Non-Agreement States	109,950	54.3	165	37.8	1.5

[a]Total resident population, July 1968.

[b]Includes five PHS personnel on loan to States.

[c]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[d]As of August 1, 1969, 19 States have entered into an agreement with the Atomic Energy Commission for regulating radioactive material previously under AEC control.

Table 10. Distribution of Agreement and Non-Agreement States by man-equivalents per million population, Fiscal Year 1969

Range: Man-equivalents per million population	Agreement States	Non-Agreement States
Total	19[a]	33
Under 1.0	-	5
1.0 - 1.9	5	12
2.0 - 2.9	8	7
3.0 - 3.9	2	5
4.0 - 4.9	2	2
5.0 - 5.9	1	1
6.0 - 6.9	-	-
7.0 - 7.9	-	-
8.0 - 8.9	1	1

[a]As of August 1, 1969, 19 States have entered into an agreement with the Atomic Energy Commission for regulating radioactive material previously under AEC control. Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Table 11. Adequacy of manpower in States by selected radiation control program areas[a]
Fiscal Year 1969

Program area	Number of States (Total 52 States)			
	Insufficient manpower	Adequate manpower	Guidelines do not apply[b]	Insufficient data
Medical X-ray	30	18	-	4
Nonmedical X-ray	25	9	9	9
Radioactive materials	20	21	7	4
Non-ionizing radiation	[c]40	[d]8	-	4

[a]Annex B, Guidelines for Determining the Present Status, and Gaps, and Inconsistencies in State Radiation Control Programs.

[b]Guidelines do not apply for States having less than 25 facilities in a selected program area.

[c]States with no manpower.

[d]States with one man-equivalent.

NOTE: Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Table 12. State radiological health professional personnel needs by program area[a]
Fiscal Year 1969

Program area	Guidelines[b] (man-equivalents)	Units	Man-equivalents		
			Needed	Available[c]	Deficient
Total Programs[d]	--	--	478	290	188
Medical X-ray	1 M.E. per 100 machines	[e]216,000	216	150	66
Nonmedical X-ray	1 M.E. per 100 installations	[f] 10,400	104	30	74
Radioactive materials		[g]8,000	80	67	[i]13
Agreement States	1 M.E. per 100 licenses	[h]2,200	22	33	--
Non-Agreement States	1 M.E. per 100 facilities	[j]56,300	56	10	46
Non-Ionizing	1 M.E. per 1000 sources				

[a] No guidelines for surveillance (125 man-equivalents available).

[b] Annex B, Guidelines for Determining the Present Status, and Gaps, and Inconsistencies in State Radiation Control Programs.

[c] Five Public Health Service personnel on loan to States have been included. There are 23 additional personnel working in administration which are not included.

[d] Excluding surveillance.

[e] Medical and dental machines only (estimate).

[f] Industrial installations only (estimate).

[g] Radium sources included (estimate).

[h] Radium facilities only (estimate).

[i] There is a surplus of 11 man-equivalents working in this program area.

[j] Lasers and microwave ovens only (estimate).

$7,294,200 for Fiscal Year 1969. Thus, Fiscal Year 1969 expenditures were $147,900 less than 1967 expenditures (table 13).

Expenditures for X-ray control and environmental surveillance as a percent of total expenditures have varied little through the years 1962 to 1969. In Fiscal Year 1962, the States spent 26.1 percent and in Fiscal Year 1969, 35.5 percent of their total radiation control budget on X-ray control. Environmental surveillance expenditures amounted to 30.4 percent of radiation control funds in 1962, and 24 percent in Fiscal Year 1969. Since 1965, the expenditures for environmental surveillance have remained very nearly constant at about 25 percent of the annual budget. This continuous and relatively high expenditure for surveillance occurred while the levels of radiation in environmental media from fallout have decreased appreciably. Expenditures for control of hazards from radioactive materials have increased from 7.9 percent of the total expenditures in 1962, to 27.2 percent in Fiscal Year 1969. In Fiscal Year 1969, only $147,600 (two percent of the total funds) was spent on electronic product radiation other than the expenditures for medical, dental, and industrial X-ray equipment previously discussed. Expenditures for this category of sources include nonionizing radiation (table 14).

Although varying in amounts, all of the States made an expenditure for the control of medical X-rays in Fiscal Year 1969. Eleven States, however, did not spend any funds for control of non-medical X-rays, 4 made no expenditures in the radioactive materials area, 24 spent none in nonionizing radiation, and 2 States had no expenditures for environmental surveillance.

A marked disparity in radiation control funds exists between the Agreement and non-Agreement States. The 19 Agreement States, with 45.7 percent of the nation's population, spent $4,709,400 or 64.6 percent of all State expenditures for radiation control (table 15).

The average national expenditure of the States for radiation control was 3.6 cents per capita for Fiscal Year 1969. Nine Agreement States, with 58 percent of the Agreement States' population, exceeded the national average. Twenty-three non-Agreement States, containing 85 percent of the non-Agreement States' population spent under the national average. The magnitude of differences in funding is more clearly seen in the per capita expenditures. The non-Agreement States spent only 2.4 cents per capita while the expenditure in Agreement States was 5.1 or 112 percent more than the non-Agreement States on a per capita basis (table 16).

Expenditures for radiation control vary greatly among the States. The maximum differences in State funds spent per capita varies by a factor of 10, as 2 States spent under 1 cent per capita and 1 State

Table 13. Total expenditures for State radiation control programs by year Fiscal Years 1962 through 1969

Year	Number of States[a]	Total expenditures[b] (in thousands)
1962	53	$2,621.2
1963	53	4,328.1
1964	53	5,335.4
1965	53	6,202.2
1966	53	6,821.2
1967	53	7,442.1
1968	52	7,375.1
1969	52	7,294.2

[a]Fiscal Years 1962-1967 figures represent 50 States plus the District of Columbia, Puerto Rico, and the Virgin Islands. Fiscal Year 1968 figures represent 49 States (Connecticut excluded) plus the District of Columbia, Puerto Rico, and the Virgin Islands. Fiscal Year 1969 figures represent 50 States plus the District of Columbia and Puerto Rico.

[b]Federal funds included in every year except 1962.

Table 14. Total expenditures for State and local radiological health activities by program area, Fiscal Years 1962 to 1969

Program area	Fiscal Year 1962		Fiscal Year 1963[a]		Fiscal Year 1964[a]		Fiscal Year 1965[a]	
	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total
Total	$2,621.2	100.0	$4,328.1	100.0	$5,335.4	100.0	$6,202.2	100.0
Basic planning and administration	713.5	27.2	937.2	21.6	1,051.0	19.7	1,036.8	16.7
X-ray survey and control	682.8	26.1	946.1	21.0	1,381.5	25.9	1,839.4	29.7
Environmental surveillance	796.4	30.4	1,757.1	40.6	1,729.1	32.4	1,781.5	28.7
Radioactive materials	207.5	7.9	459.3	10.6	761.5	14.3	1,067.5	17.2
Other radiological health activities	221.0	8.4	228.4	5.3	412.3	7.7	477.0	7.7

Program area	Fiscal Year 1966[a]		Fiscal Year 1967[a]		Fiscal Year 1968[a]		Fiscal Year 1969[a]	
	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total
Total	$6,821.2	100.0	$7,442.1	100.0	$7,375.1[b]	100.0	$7,294.2[c]	100.0
Basic planning and administration	1,283.2	18.8	1,445.8	19.4	1,388.4	18.8	1,265.0	17.3
X-ray survey and control	2,269.3	33.3	2,364.3	31.8	2,278.7	30.9	2,585.1	35.5
Environmental surveillance	1,652.4	24.2	1,860.5	25.0	1,763.2	23.0	1,749.4	24.0
Radioactive materials	1,133.4	16.6	1,300.9	17.5	1,473.8	20.0	1,547.1	21.2
Electronic products[d]	-	-	-	-	221.5	3.0	147.6	2.0
Other radiological health activities	482.9	7.1	470.6	6.3	249.5	3.4	(e)	(e)

[a] Includes Federal funds.

[b] Excludes Connecticut.

[c] Excludes Virgin Islands.

[d] This category shown in FY 1968 and 1969, previously included in "Other Radiological Health Activities."

[e] Funds have been included in the other program areas.

Table 15. Expenditures for Agreement and Non-Agreement States
Fiscal Year 1969

Type of program	Population[a] (thousands)		Expenditures[b] (thousands)		Cents per capita
	Number	Percent	Number	Percent	
Total	202,557	100.0	$7,294.2	100.0	3.6
Agreement States[c]	92,607	45.7	4,709.4	64.6	5.1
Non-Agreement States	109,950	54.3	2,584.8	35.4	2.4

[a]Total resident population, July 1968.

[b]Includes Federal funds.

[c]As of August 1, 1969, 19 States have entered into an agreement with the Atomic Energy Commission for regulating specific material previously under AEC control.

Table 16. Distribution of Agreement and Non-Agreement States by cents per capita, Fiscal Year 1969

Range: Cents per capita	Agreement States	Non-Agreement States
Total	19[a]	33
Under 1.0	-	2
1.0 - 1.9	2	9
2.0 - 2.9	4	6
3.0 - 3.9	5	8
4.0 - 4.9	3	2
5.0 - 5.9	2	3
6.0 - 6.9	2	-
7.0 - 7.9	-	-
8.0 - 8.9	-	3
9.0 - 9.9	-	-
10.0 -10.9	1	-

[a]As of August 1, 1969, 19 States have entered into an agreement with the Atomic Energy Commission for regulating radioactive material previously under AEC control. Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

spent over 10 cents per capita. Other comparisons illustrate inconsistencies in funding by the States on radiation control: 23 States, with over 100 million total population, spent less for radiation control than the total spent by 4 States serving a population of 20 million; 16 States serving 27 percent of the nation's population spent 52 percent of all State funds for radiation control; conversely, 36 States serving 73 percent of the population spent only 48 percent of the funds (table 17).

Training

An impressive number of State personnel have advanced degrees in radiological health or health physics. Nationally, a total of 54 persons in State radiation control programs have advanced degrees in some aspect of radiological health. Twenty-eight, or slightly more than half, received their degrees through the financial support of the State radiation control agency.

The 19 Agreement States, containing 46 percent of the nation's population, have 48 percent of the personnel with advanced degrees in radiological health. Based upon population served, the Agreement and non-Agreement States appear to have equal adequacy of personnel with advanced degrees. This is not true, however, because an unequal distribution leaves a large number of non-Agreement States without any personnel with advanced degrees in radiological health. Seventeen of the non-Agreement States (52 percent) are without personnel with advanced degrees. Eighty-four percent of the Agreement States have on or more staff members with advanced degrees (table 18).

The States have taken advantage of the numerous Public Health Service (PHS), Atomic Energy Commission (AEC), and other technical short courses available in radiological health and health physics. State radiation control personnel have completed a total of 3,053 man-weeks of these courses (table 19).

Eighty-four State radiation control staff members have completed the ten-week AEC health physics course and 107 persons have completed the three-week AEC course in regulatory practices and procedures. This makes a total of 191 persons who have completed a combined total of 1,160 man-weeks of technical courses conducted by the AEC. The remaining 1,893 man-week courses were largely PHS courses, with an unspecified, but relatively small number, conducted by other agencies.

The States vary widely in the number of persons who have completed technical training courses in radiological health. Arbitrarily selecting 15 man-weeks to illustrate, the personnel in 23 States have completed less than 15 man-weeks training per million population within the States. The personnel in the 29 other States have completed 15 or more man-weeks

Table 17. Radiological health expenditures in States by per capita and total population, Fiscal Year 1969

Range: Cents per capita	Number of States[a]	Expenditures[b]		Population[c]	
		Amount (thousands)	Percent distribution	Number (thousands)	Percent distribution
Total	52	$7,294.2	100.0	202,557.0	100.0
Under 1.0	2	8.0	0.1	1,146.0	0.6
1.0 - 1.9	11	948.3	13.0	63,531.0	31.4
2.0 - 2.9	10	831.1	11.4	34,735.0	17.2
3.0 - 3.9	13	1,646.4	22.6	49,174.0	24.3
4.0 - 4.9	5	368.7	5.1	7,938.0	3.9
5.0 - 5.9	5	1,187.9	16.3	23,166.0	11.4
6.0 - 6.9	2	165.7	2.3	2,717.0	1.3
7.0 - 7.9	-	-	-	-	-
8.0 - 8.9	3	165.1	2.3	2,037.0	1.0
9.0 - 9.9	-	-	-	-	-
10.0 -10.9	1	1,973.0	26.9	18,113.0	8.9

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

[b]Includes Federal funds.

[c]Total resident population, July 1968.

Table 18. Number of personnel with advanced degrees in States
Fiscal Year 1969

Number of personnel	Agreement States		Non-Agreement States	
	States	Personnel	States	Personnel
Total	19	26	33	28
0	3	-	17	-
1	8	8	11	11
2	6	12	2	4
3	2	6	1	3
4	-	-	1	4
5	-	-	-	-
6	-	-	1	6

Table 19. Distribution of States by selected man-weeks of radiological health courses completed by present staff as of June 30, 1969

Man-weeks	Number of States	Total man-weeks
Total	52[a]	3,053
Under 15	10	83
15-29	10	215
30-44	10	378
45-54	5	236
55-69	3	188
70-84	6	444
85-99	3	271
100-149	1	133
150 and over	4	1,105

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

training per million population. Much wider variation exists for a few States. Nine of the States have personnel who have completed less than 5 man-weeks training per million population, while the personnel of 1 State have completed more than 105 man-weeks for the same population base (table 20).

There is considerable variation in the number of States whose personnel have completed technical training in specific program areas. Nearly all the States have personnel who have completed training courses in medical X-ray protection, 34 States have personnel who have completed courses in radium control, 24 in non-medical, 14 in nonionizing, and 13 in radiation protection from accelerators (table 21).

This study collected training information only on the numbers of personnel with advanced degrees and man-weeks of training in radiation control. These are, of course, not the only factors that qualify State personnel. Information indicating the type of training and education needed to perform specified functions in a State radiation control program is not available.

Personnel in many States cannot attend AEC, PHS, or other technical short-term training courses because of insufficient travel funds or restrictions on out-of-State travel. Thirty-three States lack sufficient funds for personnel to attend out-of-State training courses. Fifteen of these States restrict out-of-State travel, and two prohibit it. Of the 21 States which have sufficient travel funds, 5 restrict out-of-State travel and none prohibit it.

A majority of the States (44 of 54) agreed that there is a need for PHS training courses to be conducted within their State. The States were unanimous in agreeing there is a need for the PHS to conduct training courses in nonionizing radiation for program personnel.

Very few States have been actively concerned with the training knowledge, skills, or other qualifications for operators of X-ray machines used in the healing arts. In fact, only 3 of 52 States require licensing or certification of these operators. Licensure in these three States is based upon specific standards for training and upon examinations for competency. Only nine States require training or any other qualification requirements for operators of X-ray machines used in the healing arts. On the other hand, 22 of the States require specialized training for operators of industrial radiographic equipment (table 22). The absence of State requirements for X-ray operator training assumes major importance as there are approximately 216,000 medical and dental X-ray machines in the United States.

Table 20. Distribution of the number of States in man-weeks ranges of radiological health training courses per million population, as of June 30, 1969

Man-weeks per million population	Number of States
Total	52[a]
Under 5.0	9
05.0 - 14.0	14
15.0 - 24.9	11
25.0 - 34.9	7
35.0 - 44.9	6
45.0 - 54.9	2
55.0 - 64.9	1
65.0 - 74.9	-
75.0 - 84.9	1
85.0 - 94.9	-
95.0 - 104.9	-
105.0 and over	1

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Table 21. Number of States with personnel completing training courses in selected areas as of June 30, 1969

Program area	Number of States	Number of personnel
Accelerators	13	44
Radium	34	102
Medical X-ray	50	207
Nonmedical X-ray	24	73
Non-ionizing radiation	14	29

Table 22. Number of States requiring licensing, certification, or training for X-ray machine operators, Fiscal Year 1969

Type of X-ray machine	Number of States[a]		
	Licensing	Certification	Training
Medical	2	1	9
Dental	-	2	8
Industrial radiographic	-	1	22
Other nonmedical	-	-	14

[a]Data from New York City Department of Health and New York Department of Labor have been included with New York State Department of Health.

Operators of healing art X-ray machines are of two general categories, registered X-ray technicians and non-registered X-ray operators. Registered technicians are qualified by specified training and through examination for competency by the American Society of Radiologic Technologists. Non-registered operators may be qualified in varying degrees depending upon self-study, on-the-job training, and technical courses completed; or they may be, in fact, not qualified.

Previous studies have documented the expected distinct differences in the amount of training received by the registered technicians compared to the non-registered, and, extensionally, to the non-licensed technicians. The rationale and need for States to require operators of healing are X-ray equipment to be qualified seems self-evident. However, additional studies could be useful in documenting the significance of X-ray technician licensing.

The States traditionally look to the Public Health Service for radiation control program leadership and guidance. It is improbable that many States will seriously consider licensure until the Public Health Service resolutely advocates State licensure for X-ray technologists.

Instrumentation

Laboratory and field survey instruments valued at a cumulative total of $4,760,000 have been purchased by the States. The States have adequate numbers of instruments available for surveying all types of ionizing radiation except neutron and low-energy X-ray sources. Seventeen States do not have any instruments for detection and measurement of low-energy X-rays (below 30 keV). Twenty-five of the 35 States that do have instruments for this purpose have an insufficient number. Fifty-one of 52 States possess instruments for surveying alpha, beta-gamma, and medium-energy X-ray sources. Additionally, practically all States indicate these instruments are available in sufficient numbers.

Few of the States possess the necessary instruments to survey any type of nonionizing radiation sources. Only 7 States have instruments for surveying microwave ovens, leaving 45 States without a survey capability for this nonionizing radiation source. Fifty States have an insufficient number of instruments to survey ultraviolet radiation, and 49 States have insufficient instrumentation for surveying infrared radiation sources (table 23).

Practically all the States are adequately equipped with radiation detection instrumentation and ancillary equipment. However, only 13 States have instrumentation for measurement of tritium, leaving a total

Table 23. Number of States with radiation survey instruments available for use and with adequate number of survey instruments by type of radiation Fiscal Year 1969

Type of radiation	Number of States (total 52)	
	Instruments available for use	Adequate number of instruments
Alpha	51	45
Beta	52	48
Gamma	52	45
Medium energy X-ray	51	43
Low energy X-ray (<30 keV)	35	25
Fast neutron	30	31
Therman neutron	25	27
Microwave	7	7
Infrared	3	3
Ultraviolet	2	2
Visible light	24	23
Sound	26	24
Other	2	2

of 39 States without any instrument capability for this isotope. Forty-eight States have internal proportional counters for alpha-beta radiation and 44 States possess gamma spectrometers, either multi- or single-channel (table 24).

CONCLUSIONS

Regulatory Authority

1. Generally, the States have sufficient regulatory authority to control the possession and use of electronic product and other sources of ionizing radiation.

2. The States do not have sufficient regulatory authority to control possession and use of electronic product sources of nonionizing radiation.

3. Most States have authority permitting the governor to enter into an agreement with the Atomic Energy Commission for control of certain radioactive materials previously under the jurisdiction of the Atomic Energy Commission.

4. Important gaps exist in the regulatory authority of a few States, because certain professions and radiation facilities are exempted by legislation from State radiation control.

Compliance

1. The States are providing control programs for hundreds of thousands of electronic product radiation sources.

2. State programs for the control of radiation hazards range from deficient and inadequate to comprehensive and satisfactory.

3. A majority of the States have registered a large percentage of radiation facilities but some States have registered only a small percentage or none.

4. A majority of States have inspected a large percentage of radiation facilities but some States have inspected only a small percentage or none.

5. Few States have reinspected all their facilities, and many States have reinspected none.

6. The compliance status for all radiation facilities is not known because a large number of facilities have not been inspected.

Table 24. Number of States with radiation detection instrumentation available for use and with adequate number of instruments by type of instruments Fiscal Year 1969

Type of instruments or equipment	Number of States (total 52)	
	Available for use	Adequate number
Internal proportional counter	48	41
Tritium detector	13	13
Personal dosimeter	51	43
Air sampler	50	41
Source storage containers	40	34
Decontamination equipment	39	27
Source handling tools	40	28
Gamma spectrometer	44	41
Thermoluminescent dosimetry facility	6	6
Other	12	10

7. Many radiation facilities and sources have not been brought into compliance with acceptable standards.

8. The States are not staffed to conduct control programs for the hazards from nonionizing radiation.

9. In most States the number and types of nonionizing radiation sources have not been determined.

10. Some States do not keep adequate records of registration, inspection, and other compliance data.

Manpower

1. Nationally, the States critically need additional manpower to control electronic product radiation hazards at the users' level. The States need an additional 188 full-time staff members to conduct minimum comprehensive radiation control programs.

2. Manpower in the States is currently equal to the manpower available for radiation control in 1965.

3. Except for environmental surveillance, the States have insufficient numbers of personnel in all program areas: medical X-ray, radioactive materials, non-medical X-ray, nonionizing radiation, and accelerators.

4. Manpower, in terms of man-equivalents per million population, ranges widely and inconsistently among the States.

5. Because of their agreement status, the Agreement States are generally more adequately staffed than the non-Agreement States.

6. Nationally, the States have a high proportion of available manpower assigned to environmental surveillance programs.

7. The greatest need for additional personnel in the States is in the area of electronic product radiation.

8. Most States are not presently staffed to conduct minimal control programs for nonionizing radiation hazards.

Funds

1. Nationally, the States have an immediate need for additional funds to conduct effective comprehensive programs in radiation control.

2. State expenditures for radiation control have decreased over the last two years.

3. It is improbable that the States can provide the additional resources needed to conduct adequate programs in radiation control.

4. The States have made only minimal expenditures for the control of radiation from nonionizing radiation sources.

5. The most pressing need for funds is to provide for effective control of hazards from electronic product radiation at the users' level.

6. Important funding imbalances exist among the States. Some States are sufficiently funded to adequately control radiation hazards while others are seriously underfunded.

7. Some States make no expenditures at all for certain areas of radiation control.

8. State funds for environmental surveillance programs have remained at a relatively high level since 1963 although radioactivity in environmental media from nuclear testing has decreased appreciably.

9. Because of their agreement status, the Agreement States are more successful in obtaining sufficient funds for radiation control programs than are non-Agreement States.

Training

1. The States have a high proportion of personnel with advanced degrees in radiological health or health physics.

2. The personnel of State radiation control programs have completed a large number of PHS and AEC technical training courses.

3. Competency obtained through training courses varies in the States according to program area; medical X-ray, radioactive materials, and so forth.

4. Generally, the States do not have personnel trained in the hazards and control of nonionizing radiation sources.

5. Many of the States lack sufficient funds for personnel to attend out-of-State training courses.

6. The large majority of States do not license, certify, require training, or set any qualifications for operators of X-ray machines used in the healing arts.

7. With few exceptions, the States have avoided the area of healing art X-ray operators' qualifications.

Instrumentation

1. The States possess an adequate instrument capability for detecting and measuring ionizing radiation; however, the majority of States are not sufficiently equipped with suitable instruments for surveying low-energy X-rays (below 30 keV) and neutron sources.

2. The majority of States do not possess instrumentation necessary to detect and measure radiation from nonionizing sources of radiation.

APPENDIX A

STATE RADIATION CONTROL PROGRAM QUESTIONNAIRE

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Budget Bureau No. 85-S69002
Approval Expires September 30, 1969

STATE RADIATION CONTROL PROGRAM QUESTIONNAIRE

FOR

STATE OF _____

PERSON INTERVIEWED _____

TITLE _____

INTERVIEWER _____

TITLE _____

DATE OF INTERVIEW _____

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Environmental Control Administration

Bureau of Radiological Health

Rockville, Maryland 20852

CONTENTS

INSTRUCTIONS

I - ADMINISTRATION 1

II - PERSONNEL 3

III - PROGRAM PLANNING AND EVALUATION 5

IV - LEGISLATION 6

V - REGULATIONS - CRITERIA 7

VI - INSTRUMENTATION AND EQUIPMENT 9

VII - RADIATION CONTROL ACTIVITIES 11

VIII - TRAINING 22

IX - OPINIONS 24

INSTRUCTIONS

1. Questions should be answered with the following code:

   Yes 1

   No..... 2

   Not Applicable..... A

   Not Known ..... B

   Specific number(s) when requested.

2. Every question should be answered.

3. All spaces must be coded.

   Example (0 | 0 | 3)

   (B | B)

4. All coding spaces numbered one and two, ($_1$ | $_2$), are for State identification. Enter appropriate number from the attached list of State codes.

5. Please code legibly with a soft lead pencil (i.e. No. 1 or No. 2 lead pencil).

STATE CODE

Alabama	01
Arizona	02
Arkansas	03
California	04
Colorado	05
Connecticut	06
Delaware	07
District of Columbia	08
Florida	09
Georgia	10
Idaho	11
Illinois	12
Indiana	13
Iowa	14
Kansas	15
Kentucky	16
Louisiana	17
Maine	18
Maryland	19
Massachusetts	20
Michigan	21
Minnesota	22
Mississippi	23
Missouri	24
Montana	25
Nebraska	26
Nevada	27
New Hampshire	28
New Jersey	29
New Mexico	30
New York	31
North Carolina	32
North Dakota	33
Ohio	34
Oklahoma	35
Oregon	36
Pennsylvania	37
Rhode Island	38
South Carolina	39
South Dakota	40
Tennessee	41
Texas	42
Utah	43
Vermont	44

STATE CODE

Virginia	45
Washington	46
West Virginia	47
Wisconsin	48
Wyoming	49
Alaska	50
Hawaii	51
Puerto Rico	52
Virgin Islands	53

State _____

I - ADMINISTRATION (1|2)(3|4)

1. Has a State agency been designated the primary Radiation Control Agency? (5)

   Specify _____

   By statute? (6)

2. Do any other State agencies have responsibility for radiation control?* (7)

   By statute? (8)

   a. One? Specify _____ (9)
      function _____

   b. Two? Specify (1) _____ (10)
      function _____
      (2) _____
      function _____

3. Has the State radiation control agency delegated any radiation control authority to

   a. Other State agencies? (11)

   b. Counties? (12)

   c. Cities? (13)

4. Do local health agencies conduct any radiation control activities, delegated or otherwise

   a. Counties? (14)

   b. Cities? (15)

5. Does the State radiation control agency provide

   a. Funds for local activities? (16)

   b. Personnel assigned to local level? (17)

*Ionizing and non-ionizing radiation

State _____

6. Does the State have an agreement with the Atomic Energy Commission? ( ) 18

7. Is there a

   a. Radiation advisory board or committee? ( ) 19

   b. Medical radiation committee? ( ) 20

   c. Industrial radiation committee? ( ) 21

   d. Non-ionizing radiation committee? ( ) 22

   e. Atomic Energy Coordinator? ( ) 23

   f. Atomic Energy committee? ( ) 24

   g. Other - specify _____ ( ) 25

8. How much did the State radiation control program spend during fiscal year ending June 30, 1969? $_____ (| |) 26 27 28

9. How much was spent for

   a. Basic planning and administration? $_____ (|) 29 30

   b. Medical X-ray survey and control? $_____ (|) 31 32

   c. Nonmedical X-ray survey and control? $_____ (|) 33 34

   d. Radioactive materials control? $_____ (|) 35 36

   e. Non-ionizing radiation control? $_____ (|) 37 38

   f. Radiation surveillance? $_____ (|) 39 40

Round off in thousands

State _____

II - PERSONNEL

1. Is there a personnel position for radiation control director. Specify title _____ ( ) 41
2. Does he work full time in radiological health? ( ) 42
3. Are radiation control positions included in the State merit system?
   a. Radiation control director? ( ) 43
   b. All other professional positions?* ( ) 44
   c. Sub or semiprofessionals? ( ) 45
4. Are there written position descriptions for
   a. Radiation control director? ( ) 46
   b. All other professional positions? ( ) 47
   c. Sub or semiprofessionals? ( ) 48
5. Is it possible for any staff professional to advance to the position of radiation control director? ( ) 49
6. How many professional positions are currently
   a. Filled? Number (|) 50 51
   b. Vacant? Number ( ) 52
7. How many sub or semiprofessional positions are currently
   a. Filled? Number (|) 53 54
   b. Vacant? Number ( ) 55

*Bachelor's degree minimum

State_____

8. How many full time professionals work part time in radiation control? Number (56)

9. How many man equivalents* work in

   a. Total radiological health program (57 | 58)

   b. Medical X-ray (59 | 60)

   c. Non-medical X-ray (61 | 62)

   d. Radioactive material (63 | 64)

   e. Non-ionizing (65)

   f. Radiation surveillance (66 | 67)

*Example: If two people spend half their time in a particular program, then man equivalents equal one. Please use whole number man equivalents when coding.

State _____

III - PROGRAM PLANNING AND EVALUATION

1. Is there a written radiation control program plan? ( ) 68

2. Does the plan

   a. Define the radiation problem? ( ) 69

   b. Set short-term objectives? ( ) 70

   c. Set long-term objectives? ( ) 71

   d. State methods to fulfill objectives? ( ) 72

   e. Set program priorities? ( ) 73

   f. State methods to evaluate progress? ( ) 74

3. Does the plan include non-ionizing radiation? ( ) 75

4. Is the plan revised

   a. Each fiscal year? ( ) 76

   b. Each biennium? ( ) 77

   c. Longer periods? ( ) 78

5. Is there a radiological control program response plan for radiation emergencies?

   a. Written plan? ( ) 79

   b. Unwritten plan? ( ) 80

State_____ (1)(0 1 2)
1 2 3 4

IV - LEGISLATION

1. Is there specific legislation authorizing*

   a. Regulation of ionizing radiation? ( ) 5

   b. Regulation of non-ionizing radiation? ( ) 6

   c. An AEC-State agreement? ( ) 7

   d. Reciprocity with other States? ( ) 8

   e. Other ( ) 9

      Specify _____

2. If legislation is not specific, is regulatory authority assumed, under the general health laws

   a. For ionizing radiation? ( ) 10

   b. For non-ionizing radiation? ( ) 11

3. Are any professions or categories of use exempted by legislation? (Examples: healing arts, chiropractors, veterinarians) ( ) 12

   Specify _____

4. Has proposed radiation control legislation been introduced in the current session of legislature? ( ) 13

   Specify_____
   (Example: regulation of laser systems)

5. Is it anticipated that radiation control legislation will be proposed for enactment during the next 12 months? ( ) 14

   Specify_____
   (Example: regulation of non-ionizing radiation sources)

*Specific as opposed to authority under general health law.

State_____

V - REGULATIONS - CRITERIA

	Indicate Answer	Regulations are in Substantial Agreement with CSG*
1. Are there enforceable regulations for		
a. Medical X-ray?		
(1) Radiographic?	( ) 15	( ) 16
(2) Fluoroscopic?	( ) 17	( ) 18
(3) Therapeutic?	( ) 19	( ) 20
b. Dental X-ray	( ) 21	( ) 22
c. Veterinary X-ray	( ) 23	( ) 24
d. Industrial radiographers, radioactive materials?	( ) 25	( ) 26
e. Industrial radiographers, X-ray	( ) 27	( ) 28
f. Other nonmedical X-ray equipment**	( ) 29	( ) 30
g. Radium		
(1) Healing arts?	( ) 31	( ) 32
(2) Nonmedical?	( ) 33	( ) 34
h. All other radioactive materials		
(1) Healing arts?	( ) 35	( ) 36
(2) Nonmedical?	( ) 37	( ) 38
i. Accelerators?	( ) 39	( ) 40
j. Laser devices?	( ) 41	( ) 42
k. Microwave ovens?	( ) 43	( ) 44
l. Other non-ionizing sources?	( ) 45	( ) 46
Specify_____		

*Council of State Governments Suggested State Regulations.
**Example: X-ray equipment used in schools, X-ray diffraction, etc.

State_____

2. Are there written criteria

   a. For design and construction of

      (1) Sealed sources? ( ) 47

      (2) Devices containing sealed sources? ( ) 48

   b. For limits of radiocontamination governing

      (1) Release of facilities? ( ) 49

      (2) Release of equipment? ( ) 50

      (3) Working conditions? ( ) 51

3. Are source owners or operators supplied with copies of applicable regulations, or standards, or criteria

   a. Routinely? ( ) 52

   b. Only on request? ( ) 53

   c. Not at all? ( ) 54

State_____

VI - INSTRUMENTATION AND EQUIPMENT

1. Are survey instruments available for detecting and measuring the following types of radiation?

	Available	Adequate Number
a. Alpha	( ) 55	( ) 56
b. Beta	( ) 57	( ) 58
c. Gamma	( ) 59	( ) 60
d. Medium energy X-ray	( ) 61	( ) 62
e. Low energy X-ray (<30 keV)	( ) 63	( ) 64
f. Fast neutron	( ) 65	( ) 66
g. Thermal neutrons	( ) 67	( ) 68
h. Microwave	( ) 69	( ) 70
i. Infrared	( ) 71	( ) 72
j. Ultraviolet	( ) 73	( ) 74
k. Visible light	( ) 75	( ) 76
l. Sound levels	( ) 77	( ) 78
m. Other	( ) 79	( ) 80

Specify _____

2. Are instruments and equipment of these types available? (|)(0 | 3) 1 2 3 4

a. Internal proportional counter?	( ) 5	( ) 6
b. Tritium detectors?	( ) 7	( ) 8
c. Personal dosimeters?	( ) 9	( ) 10
d. Air samplers?	( ) 11	( ) 12
e. Source storage containers?	( ) 13	( ) 14

State _____

f.	Decontamination equipment?	( ) 15	( ) 16
g.	Source handling tools?	( ) 17	( ) 18
h.	Gamma spectrometer?	( ) 19	( ) 20
i.	Thermoluminescent dosimetry facility?	( ) 21	( ) 22
j.	Other	( ) 23	( ) 24

Specify _____

State _____

VII - RADIATION CONTROL ACTIVITIES

1. Are surveys* of radiation facilities made to determine compliance with regulations

   a. Licensees (25)

   b. Registrants (26)

2. Is written notification made of noncompliance with regulations or recommended standards

   a. To licensees (27)

   b. To registrants (28)

   c. Others known to possess radiation sources (29)

3. Is written verification for corrected items of noncompliance required

   a. From licensees (30)

   b. From registrants (31)

   c. Others known to possess radiation sources (32)

4. Are follow-up inspections made to determine correction of major deficiences

   a. For licensees (33)

   b. For registrants (34)

   c. Others known to possess radiation sources (35)

5. Is radium

   a. Licensed (36)

   b. Registered (37)

   c. Regulated in similar manner to "agreement materials" (38)

*Survey and/or inspection

State _____

6. Are accelerator produced materials

   a. Licensed (39)

   b. Registered (40)

   c. Regulated in similar manner to "agreement materials" (41)

7. In the absence of enforceable regulations, are surveys* of radiation facilities made to determine adherance to nationally recognized radiation safety standards? (42)

*Survey and/or inspection

State _____

e. What number and percentage of these facilities have been

	Licensed or Registered		Surveyed Initially**		Resurveyed***	
	No.	%	No.	%	No.	%
a. Physician X-ray						
b. Medical clinic X-ray						
c. Hospital X-ray						
d. Dental X-ray						
e. Chiropractic X-ray						
f. Veterinary X-ray						
g. Osteopathic X-ray						
h. Podiatrist X-ray						
i. Schools*						
j. Industrial Radiography X-ray						

*High schools, trade schools, colleges, universities
**First survey or inspection
***Second survey or inspection after the initial and follow-up surveys

State_____

8. What number and percentage of these facilities have been

	Licensed or Registered		Surveyed Initially**		Resurveyed***	
	No.	%	No.	%	No.	%
k. Other industrial X-ray	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)
l. Accelerator	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)
m. Laser	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)
n. Microwave	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)
					(|)	(0 1 7)
o. Radium	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)
p. Other	(| | | |)	(| |)	(| | | |)	(| |)	(| | | |)	(| |)

Specify _____

**First survey or inspection
***Second survey or inspection after the initial and follow-up surveys.

15

State_____

9. Of the following facilities* surveyed during the last three years, how many were found in compliance with applicable regulations or nationally recognized standards**?

	Number Surveyed	Number in Compliance	Percent in Compliance
a. Physician X-ray	(| | |) 41 42 43 44	(| | |) 45 46 47 48	(|) 49 50
b. Medical Clinic X-ray	(| | |) 51 52 53 54	(| | |) 55 56 57 58	(|) 59 60
c. Hospital X-ray	(| | |) 61 62 63 64	(| | |) 65 66 67 68	(|) 69 70
			(|)(0 | 8) 1 2 3 4
d. Dental X-ray	(| | |) 5 6 7 8	(| | |) 9 10 11 12	(|) 13 14
e. Chiropractic X-ray	(| | |) 15 16 17 18	(| | |) 19 20 21 22	(|) 23 24
f. Veterinary X-ray	(| | |) 25 26 27 28	(| | |) 29 30 31 32	(|) 33 34
g. Osteopathic X-ray	(| | |) 35 36 37 38	(| | |) 39 40 41 42	(|) 43 44
h. Podiatrist X-ray	(| | |) 45 46 47 48	(| | |) 49 50 51 52	(|) 53 54
i. Schools***	(| | |) 55 56 57 58	(| | |) 59 60 61 62	(|) 63 64
j. Industrial Radiography X-ray	(| | |) 65 66 67 68	(| | |) 69 70 71 72	(|) 73 74
			(|)(0 | 9) 1 2 3 4
k. Other industrial X-ray	(| | |) 5 6 7 8	(| | |) 9 10 11 12	(|) 13 14
l. Accelerator	(| | |) 15 16 17 18	(| | |) 19 20 21 22	(|) 23 24
m. Laser	(| | |) 25 26 27 28	(| | |) 29 30 31 32	(|) 33 34
n. Microwave	(| | |) 35 36 37 38	(| | |) 39 40 41 42	(|) 43 44
o. Radium	(| | |) 45 46 47 48	(| | |) 49 50 51 52	(|) 53 54
p. Other: specify_____	(| | |) 55 56 57 58	(| | |) 59 60 61 62	(|) 63 64

*Count each facility only once
**HB 76, NCRP 33, CSG Suggested State Regulations, etc.
***High schools, trade schools, colleges, universities

State_____

10. What is the frequency of resurveys of radiation facilities (in years under appropriate column).

	Planned (whole years)	Actual (whole years)
a. Physician X-ray	(|) 65 66	(|) 67 68
b. Medical Clinic X-ray	(|) 69 70	(|) 71 72
c. Hospital X-ray	(|) 73 74	(|) 75 76
d. Dental X-ray	(|) 77 78	(|) 79 80
		(|)(1 | 0) 1 2 3 4
e. Chiropractic X-ray	(|) 5 6	(|) 7 8
f. Veterinary X-ray	(|) 9 10	(|) 11 12
g. Osteopathic X-ray	(|) 13 14	(|) 15 16
h. Podiatrist X-ray	(|) 17 18	(|) 19 20
i. Schools*	(|) 21 22	(|) 23 24
j. Industrial Radiography X-ray	(|) 25 26	(|) 27 28
k. Other industrial X-ray	(|) 29 30	(|) 31 32
l. Accelerator	(|) 33 34	(|) 35 36
m. Laser	(|) 37 38	(|) 39 40
n. Microwave	(|) 41 42	(|) 43 44
o. Radium	(|) 45 46	(|) 47 48
p. Other: Specify_____	(|) 49 50	(|) 51 52

*High schools, trade schools, colleges, universities

State_____

11. Are licensing or registration applications for radium and accelerator produced materials reviewed for

	Licensed	Registered
a. User qualifications?	( ) 53	( ) 54
b. Proposed use?	( ) 55	( ) 56
c. Facilities and equipment?	( ) 57	( ) 58
d. Instrumentation?	( ) 59	( ) 60
e. Possession limits?	( ) 61	( ) 62
f. Radiation safety program?	( ) 63	( ) 64

12. Are prelicensing or preregistration surveys made for these facilities?

	Routinely?	If Considered Necessary?
a. Radium?	( ) 65	( ) 66
b. Accelerator produced material?	( ) 67	( ) 68
c. Accelerators?	( ) 69	( ) 70
d. Medical X-ray?	( ) 71	( ) 72
e. Hospital X-ray?	( ) 73	( ) 74
f. Therapeutic X-ray?	( ) 75	( ) 76
g. Nonmedical X-ray?	( ) 77	( ) 78
h. Other: specify _____	( ) 79	( ) 80

(|)(1 | 1)
1 2 3 4

13. Do substantially* all source owners or operators have copies of applicable regulations? ( ) 5

*Most, as opposed to 100%

State_____

14. Is notification to the radiation control agency required before new or remodeled facilities become operational and are design plans approved by the State?

	Notification	Design Approval
a. Radium?	( ) 6	( ) 7
b. Accelerator produced materials?	( ) 8	( ) 9
c. Hospital X-ray?	( ) 10	( ) 11
d. Accelerator?	( ) 12	( ) 13
e. Medical X-ray?	( ) 14	( ) 15
f. Nonmedical X-ray?	( ) 16	( ) 17
g. Other: specify _____	( ) 18	( ) 19

15. Have any special studies* been made for:

a. Lasers?	( ) 20
b. Microwave ovens?	( ) 21
c. Ultra-sonic generators?	( ) 22
d. Color television sets?	( ) 23
e. Accelerators?	( ) 24
f. Radiation sources in schools?	( ) 25
g. Others: specify_____	( ) 26

16. Are records kept of

a. Source registrations?	( ) 27
b. Survey reports?	( ) 28
c. Survey compliance data?	( ) 29

*Example: Surveys to determine degree of radiation hazard

State_____

d. Enforcement actions? ( ) 30

e. X-ray machine transfers? ( ) 31

f. Incident and accident investigations? ( ) 32

17. Is automatic data processing used in record keeping? ( ) 33

18. How many X-ray machine operators are there*

a. Medical X-ray? Estimated number (| | | |) 34 35 36 37 38

b. Nonmedical X-ray? Estimated number (| | | |) 39 40 41 42 43

19. Is there a State requirement that operators of the following X-ray equipment be registered, licensed, certified, or have any X-ray training?

	Medical Diagnostic	Medical Therapeutic	Dental X-ray
a. Registered	( ) 44	( ) 45	( ) 46
b. Licensed	( ) 47	( ) 48	( ) 49
c. Certified	( ) 50	( ) 51	( ) 52
d. X-ray training	( ) 53	( ) 54	( ) 55

	Industrial Radiography X-ray	Other Non-Medical X-ray
a. Registered	( ) 56	( ) 57
b. Licensed	( ) 58	( ) 59
c. Certified	( ) 60	( ) 61
d. X-ray training	( ) 62	( ) 63

*All persons who operate X-ray machines.

State_____

20. How many X-ray technicians are registered by the American Registry of Radiologic Technologists? (| | | |) 64 65 66 67 68

21. Are any requirements for X-ray installations constructed under Hill-Burton more stringent than other similar X-ray installations? ( ) 69

22. Are any requirements for X-ray installations participating in Medicare more stringent than other similar X-ray installations? ( ) 70

23. Are X-ray installations participating in Medicare surveyed more frequently than other similar X-ray installations? ( ) 71

24. Is the radiation control program the approving or certifying agency for?

    a. Hill-Burton X-ray installations? ( ) 72

    b. Medicare X-ray installations? ( ) 73

25. Are the following required to bring used* X-ray machines up to applicable standards before transferring ownership or control to another individual

    a. Private owner-user ( ) 74

    b. Vendor ( ) 75

26. Are the following required to notify the agency when such transfer is made

    a. Private owner-user ( ) 76

    b. Vendor ( ) 77

*X-ray machine transferred from a user-owner, directly or through a vendor, to another user-owner.

State_____

27. Were any very old (antiquated) X-ray machines found incapable of being altered to meet applicable standards? ( ) 78

28. Is the continued use of such equipment permitted? ( ) 79

29. Are such machines allowed to be transferred for reuse? ( ) 80

(|)(1|2)
1 2 3 4

30. How many new X-ray machines were installed during 1968? Number (| | |) 5 6 7 8

31. How many used* X-ray machines were installed or transferred in ownership during 1968? Number (| | |) 9 10 11 12

*X-ray machine transferred from a user-owner, directly or through a vendor, to another user-owner.

State _____

VIII - TRAINING

1. How many present staff members have completed training courses specifically in the control of hazards from

   a. Accelerators? Number (|) (13, 14)

   b. Radium? Number (|) (15, 16)

   c. Medical X-ray? Number (|) (17, 18)

   d. Nonmedical X-ray? Number (|) (19, 20)

   e. Non-ionizing radiation sources? Number (|) (21, 22)

2. How many present staff members have received an advanced ** degree in the area of radiological health through radiation control program sponsorship? Number ( ) (23)

3. How many present staff members have an advanced** degree in the area of radiological health or health physics? Number (|) (24, 25)

4. How many present staff members have completed Atomic Energy Commission courses?

   a. Ten-week health physics? Number (|) (26, 27)

   b. Regulatory Practices and Procedures? Number (|) (28, 29)

5. How many man-weeks of total courses have the present staff completed?* Number (| |) (30, 31, 32)

6. Are difficulties encountered in attempting to attend out-of-State courses because of

   a. Insufficient funds? ( ) (33)

*Example: Any BRH or AEC course
**Master's degree or above

State_____

b. Restrictive out-of-State travel policy? ( ) 34

c. Prohibitive out-of-State travel policy? ( ) 35

d. Other: specify _____ ( ) 36

7. Has the radiation control program conducted training for the staff

a. Seminars? ( ) 37

b. Demonstrations? ( ) 38

c. Lectures? ( ) 39

d. Courses? ( ) 40

e. Films? ( ) 41

f. Other: specify_____ ( ) 42

8. In the last three years, has the radiation control program conducted training courses for

a. Users of radioactive materials? ( ) 43

b. Operators of medical X-ray machines? ( ) 44

c. Operators of nonmedical X-ray machines? ( ) 45

d. Users of non-ionizing radiation sources? ( ) 46

9. Have special educational materials (brochures, etc.) been developed for the following

a. Radioactive materials ( ) 47

b. Medical X-ray ( ) 48

c. Non-medical X-ray ( ) 49

d. Non-ionizing radiation sources ( ) 50

67

State_____

IX - OPINIONS

In your opinion -

1. Are these standards adequate

	For New Machines	For Used Machines
a. NBS Handbook #76?	( ) 51	( ) 52
b. NCRP Report #33?	( ) 53	( ) 54
c. NBS Handbook #93?	( ) 55	( ) 56
d. CSG Suggested State Regulations?	( ) 57	( ) 58

2. Should there be separate standards for used X-ray machines* ( ) 59

3. Should used X-ray machines* be required to meet all applicable equipment standards before being sold or transferred? ( ) 60

4. Is the use of very old (antiquated) X-ray machines more hazardous than newer machines? ( ) 61

5. What percentage of new X-ray machine installations is brought to the programs' attention? Percent (|) 62 63

6. What percentage of used X-ray machine* sale or transfer is brought to the programs' attention? Percent (|) 64 65

7. Would the State be interested in entering into a contract with DHEW for certain electronic products control? ( ) 66

8. Is there a need for additional funds to control

   a. Radioactive materials? ( ) 67

   b. Medical X-rays? ( ) 68

*X-ray machine transferred from a user-owner, directly or through a vendor, to another user-owner.

State_____

c. Nonmedical X-rays? ( ) 69

d. Accelerators? ( ) 70

e. Non-ionizing radiation sources? ( ) 71

9. Is there a need for BRH training courses in non-ionizing radiation for State program personnel? ( ) 72

10. Is there a need for any BRH training course to be conducted within the State? ( ) 73

11. Is there a need for suggested regulations for*

a. Accelerators? ( ) 74

b. Nonmedical X-ray equipment?** ( ) 75

c. Non-ionizing radiation sources? ( ) 76

12. Is there a need for BRH to distribute technical evaluations of electronic products to States? ( ) 77

13. Which State agency will probably be given responsibility for non-ionizing radiation control?

Agency: Program:

14. Is your State interested in controlling radiation hazards from electronic products?

a. Ionizing ( ) 78

b. Non-ionizing ( ) 79

15. Is there a need for a model records system? ( ) 80

*Example: CSG Suggested State Regulations
**Example: X-ray equipment used in schools, x-ray diffraction equipment.

APPENDIX B

Guidelines for Determining the Present Status, Gaps, and Inconsistencies in State Radiation Control Programs

Prepared by
Bureau of Radiological Health
and
Radiological Health Representatives
Environmental Control Administration

January 1969

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A - ADMINISTRATION

I. LEGISLATION AND REGULATIONS

a. Legislation

1. The State should have enabling legislation essentially in conformity with the Council of State Governments suggested legislation, including authority to enter into interstate and federal-state arrangements for the control of radiation hazards.

2. Legislation should include authority for licensing and inspection of radioactive materials not included under the Atomic Energy Act of 1954 as amended.

3. Legislation should also contain the following provisions:

   Reciprocity between the various States.

   Coverage of all types of radiation as defined in PL 90-602.

b. Regulations

The State should have regulations which include the following provisions:

1. Essential compatibility with the Council of State Governments suggested regulations.

2. Coverage of all types of radiation as defined by PL 90-602.

II. FISCAL SUPPORT

The State should have adequate fiscal support to conduct a comprehensive radiation program, covering all types of radiation as defined by PL 90-602.

-2-

The total State budget required to conduct a comprehensive State radiological health program may be estimated by the following formula:

$$\frac{\text{(FY 69 Budget for Radiological Health)}}{\text{(FY 68 No. of Man-equivalent)}} \times \text{Total Man-equivalent}$$

needed for program + (10% FY 1969 Budget) = total recommended budget.

III. PERSONNEL

a. Radiation Control Program Director Qualifications

The director should have wide experience in public health programming plus either physical, science, biological, or engineering degrees and at least a bachelor's degree.

b. Merit System Classification

State should have specifications for professional employees functioning in the radiation control field.

c. Job descriptions

Each State professional employee in the State radiation control programs should have an accurate, up-to-date description of his position, detailing specific responsibilities, and authority.

d. Career Development

It should be possible for any professional entering the system to progress through the various levels up to and including radiation control director.

e. Turn over

The personnel active in inspecting radiation sources for compliance should not leave the program in excess of 50% during a three-year period except for promotion or transfer to other radiological health program areas.

IV. TRAINING

In-service

The State radiation control program should have a planned continuing program in-service training consisting of seminars, demonstrations, lectures by consultants, short-and long-term training, etc., to keep personnel abreast of current developments in the control of radiation hazards.

V. RECORDS

a. The State should have a records and statistical system which includes the following components:

1. A continuing integrated registration or licensing program covering all radiation sources.
2. Physical survey forms containing minimum uniform data for all radiation sources; and compliance and enforcement actions.
3. Data accurately and rapidly retrievable.
4. Radiation control employee personnel monitoring results.
5. Fiscal and other administrative records.
6. Records of machine transfers and vendor notification.
7. Records of incidents and investigations.

b. The State should utilize the above records in:

1. Program planning and evaluation.
2. Carrying out field survey and inspection programs.

VI. PROGRAM ORGANIZATION

a. Ideally all State radiation control activities should be located in the same agency.

b. Advisory Committees

The program should have a technical advisory committee that advises the radiation control program director on all facets of the State programs. Membership on this committee should represent those professional disciplines knowledgeable in the uses of radiation for both medical and nonmedical applications.

VII. PROGRAM PLANNING AND EVALUATION

Each State should have a written plan of action describing present and future program activities. The plan should include the following basic components:

1. Problem

   In defining the problem the State should include the extent, nature of the radiation exposures involved and, in so far as possible, the population affected.

2. Objectives

   The State plan should set forth both long- and short-term objectives. Based on current and anticipated resources, target dates should be established for priority projects.

3. Methodology

   The State plan should describe those activities directed to fulfill stated objectives.

4. Evaluation

   The plan should include a method of evaluating (involving the establishment of criteria) the progress of the State programs. Important components of the State evaluation program should include an assessment of the radiation hazards and population affected for setting priorities.

VIII. PUBLIC INFORMATION AND EDUCATION

1. The State should have an information-education program and mechanism relating to emissions from electronic products, including emergency situations.
2. The State should maintain liaison with professional groups leading to seminars, training courses, and public documents on radiation control.
3. The State should provide licensees and registrants with current reference materials, guidelines, and standards as they are available.

IX. STANDARDS

In addition to the regulations, standards dealing with the following subjects should be adopted and available in writing.

1. Standards for the design and construction of sealed sources and devices containing sealed sources.
2. Standards for licensing the manufacture and distribution of generally licensed and exempt devices containing radioactive materials.
3. Standards for limits of contamination from radioactive materials for working conditions and for release of facilities or equipment to uncontrolled use.
4. Accelerator standards similar to, or compatible with, those standards presently under consideration by the USASI N-43 Committee or proposed by the NCRH.

X. SPECIAL STUDIES

State radiation control programs should have sufficient personnel, fiscal support, and initiative to undertake special studies of particular concern to their local area involving X-ray protection, radioactive materials and accelerators.

B - MACHINE PRODUCED RADIATION

I. INTENTIONAL EXPOSURE (MEDICAL, DENTAL, ETC.)

a. Personnel

State radiation control X-ray program personnel should be qualified by training and experience in the field of X-ray hazards and control. Inspection personnel should include qualified college graduates and/or technicians with a minimum of formal two-year training in a school of X-ray technology, in radiation control, or the equivalent.

Assuming a reinspection schedule of five years, with 20% of all registered machines subject to reinspection each year with a one-man team, the personnel active in inspecting X-ray machines for compliance and completing all reports, follow-up visits and related activities should number at least one man-equivalent per 1,000 machines.

b. Equipment

Field X-ray equipment and instrumentation should be capable of detecting and measuring X-radiation exposure to patients, the public and personnel.

The State X-ray control program should be capable of providing for or obtaining routine calibration and servicing of all X-ray equipment and instrumentation.

1. For each man-equivalent in the field, a survey kit should be provided containing at a minimum an integration ionization chamber, ionization rate meter, and glow bars.

2. Calibration and Servicing

   There should be a system for calibration and servicing of each radiation detection instrument on a planned schedule. Calibration may be done by the State radiation control program using its own calibration source, equipment, and procedures or by a commerical instrument calibration and repair service under contract. Such calibration and servicing should be the responsibility of one member of the program staff. Each instrument should bear a tag stating the latest date of servicing and calibration and a calibration curve or correction factors for each detection range.

3. Standards

   A State X-radiation control X-ray program should adopt or use performance standards which are based on or identical with current Council of State Governments recommendations, with such modifications as may be deemed necessary by the State.

   The State should regularly provide all owners of X-ray machines with written copies of current standards and/or recommendations applicable to his X-radiation source. The State should require the owner to inform all employees of their responsibilities for radiation control.

To determine compliance, a State should conduct its own inspections, obtain survey reports from qualified private consultants or from radiation safety officers employed by the owner of an X-ray installation or a combination of these approaches. The State should establish the qualifications for private consultants or radiation safety officers when the survey reports by such individuals are used by the State to evaluate continuing compliance with its standards or recommendations.

4. Notification

Each State should require prior notification, review, or approval of new or remodeled installation.

5. Inspection schedule

A periodic inspection system based upon hazard priority should be established and adhered to: An example of this would be:

a.	Dental X-ray machines	- every 5 years
b.	Medical X-ray machines	- every 2 years
c.	Hospital or similar facility	- every year
d.	Clinic (radiologist)	- every year
e.	Chiropractors	- every year
f.	Osteopaths	- every 2 years
g.	Veterinarians	- every 2 years

6. User education

The State should encourage sponsor or conduct continuing, formal educational programs for users or operators of X-ray sources. Specific attention should be given to establishing and achieving an uniform minimal level of training in radiological health for all operators of X-radiation machines.

c. Activities

1. Source Location and Identification

A State X-ray control program should locate and identify all users of X-ray machines. The mechanism for locating and identifying X-ray machines should be known to all present and prospective users of such machines.

A State should maintain a current tabulation or directory of all X-ray machines within the State.

2. Compliance Determination and Enforcement

A State X-ray control program should be capable of determining compliance of all X-ray machines and installations with applicable standards.

CRITERIA

II. NONMEDICAL

a. Personnel

A State agency should have personnel qualified by training and experience to conduct a program in the evaluation and control of all nonmedical sources of X-ray equipment. Such installations may include, but are not limited to: industrial uses of X-ray machines, X-ray machines used for or constructed as part of an educational program in any teaching institution, devices which use X-radiation for analytical or research purposes, X-ray emitting devices incorporated in electronic systems, facilities for the manufacture and testing of devices or electronic products capable of incidentally emitting X-rays, or electronic products capable of incidentally emitting X-radiation in actual use.

Such personnel should include at least one qulaified professional man equivalent or technician per 100 installations, assuming a one-man team conducts an annual inspection of each installation. Such installations are not intended to include television receivers.

b. Equipment

Field X-ray Survey equipment should be capable of detecting and measuring at the specific X-ray energy spectra under consideration intensity and dimensions of the emitted field from the specific X-ray source under inspection.

~~11~~

Such equipment and instrumentation should be regularly calibrated and serviced consistent with the X-ray hazard to be inspected.

c. Activities

1. Source Location and Identification

A State agency should establish a program to locate and identify all nonmedical installations of X-ray exclusive of television receivers in private homes or other residences. The mechanism for locating and identifying X-ray machines should be known to all present and prospective users of such machines.

A state agency should maintain a current tabulation or directory of all such X-radiation sources or installations within the State.

2. Compliance Determinations

A State agency should establish a control program capable of determining compliance of all nonmedical X-ray installations with applicable standards. To determine compliance, a State should conduct its own inspections, obtain survey reports from qualified private consultants or from radiation safety officers employed by the owner of an X-ray source or installation, or a combination of these approaches. The State should establish the qualifications for private consultants or radiation safety officers when the survey reports by such individuals are used by the State to evaluate continuing compliance with its standards or recommendations.

3. Standards

A State control program for nonmedical X-ray should adopt or use performance standards which are based on or identical with current Council of State Governments recommendations, with such

~~12~~

modification as may be deemed necessary by the State.

The State should regularly provide all owners of such X-ray sources or installations with written copies of current standards and/or recommendations applicable to his X-radiation source or installation. The State should require that the owner inform all employees of their responsibilities for radiation control.

4. Inspection Schedule

A State agency should determine the priorities for obtaining compliance of each type of X-ray installation based upon the radiation exposure hazard to the public or personnel.

5. User Education

The State control program for nonmedical X-radiation installations should encourage, sponsor or conduct continuing, formal educational programs for users or operators of such X-radiation sources or installations.

C. RADIOACTIVE MATERIALS AND ACCELERATORS ~~13~~

a. Organization Structure and Program Direction

A distinct program entity should exist which provides for the control of radioactive materials including radium and accelerator produced radioactive materials. Control of particle accelerators should be the designated responsibility of the specific program component concerned with the control of machine produced ionizing radiation.

b. Personnel

1. Number of Personnel

(i) For radioactive materials, the State should have an adequate number of competent professionals in a ratio of not less than one man equivalent per each one hundred licenses. An adequate number of clerical personnel should exist to permit prompt handling of all licensing actions, inspection reports, and correspondence pertaining thereto.

(ii) At least one professional competent in the evaluation and control of accelerator hazards.

2. Types

Bachelor's or graduate degree in engineering, biological, or physical sciences with minimum of two years radiological or related experience.

3. Training

(i) Pre-employment qualifications

Other than for the beginning category in the State program, each employee in the radioactive materials and/or accelerator

activities should have specialized radiological sciences training such as the AEC ten weeks Health Physics course or its equivalent.

(ii) Short-term specific training

In addition to the above qualifications, each employee involved in radioactive materials control should complete the NCRH "Radium Hazards and Control Course" and other appropriate courses. Each employee involved in accelerator activities should complete the "Accelerator Hazards and Control Course" provided by NCRH or its equivalent provided by a college or university.

c. Equipment

1. Numbers and Types of Equipment

Each program should include adequate field and laboratory instrumentation to detect and measure all types of radiations which could be emitted in radioactive materials and accelerators. This should include, but not be limited to, such things as:

(1) GM detectors

(2) Portable alpha detectors (gas flow and scintillation)

(3) Portable neutron instruments

(4) Ionization chambers-rate and integrating types

(5) Tritium detectors

(6) Internal proportional counters

(7) Personnel protective instruments (chirpies, dosimeters, etc.)

(8) Air sampling equipment

(9) Miscellaneous equipment

(a) Source handling tools

(b) Source storage containers

(c) Anti-contamination clothing and equipment

2. Calibration and Servicing

There should be a system for calibration and servicing of each radiation detection instrument on a planned schedule. Calibration may be done by the State radiation control program using its own calibration source, equipment, and procedures or by a commercial instrument calibration and repair service under contract. Such calibration and servicing should be the responsibility of one member of the program staff. Each instrument should bear a tag stating the latest date of servicing and calibration and a calibration curve or correction factors for each detection range.

d. Activities

1. Source location and identification

(i) Licensing

(a) Review of application

The review of an application for a radioactive materials license must include a detailed health physics analysis of at least the following:

User qualifications

Potential uses

Types and amounts of radioactive materials requested

Facilities and equipment

Instrumentation

Radiation safety program of user

(b) Pre-licensing evaluation

The program should include a pre-licensing survey or inspection of those applications involving a significant risk to the public health and safety.

(c) The time lag between submission of an application or amendment request and action by the State radiation control agency should not exceed fifteen days.

Licenses should contain specific conditions covering health and safety items not covered by the regulations or peculiar to the specific program of the licensee.

(ii) Registration

All particle accelerators should be registered in accordance with the following specific registration requirements for such devices:

(a) Submission and approval of facility design

Engineering designes

Safety systems

(b) Submission and approval of operational and emergency procedures

(c) Preoperational inspection by State personnel

(ii) Unlicensed or unregistered sources

The State should have a planned system of locating unlicensed or unregistered sources of radiation and bringing them into compliance with the State licensing

~~17~~

and registration provisions.

2. Compliance Determination and Enforcement

(i) Inspections

(a) Pre-licensing

(b) Original

(c) Follow-up

(d) Reinspections

(ii) Compliance and enforcement

(a) Items of noncompliance with appropriate state standards or regulations found during inspections should be promptly called to the attention of the licensee or registrant in writing with a requirement that he institute prompt action to correct the cited deficiencies. The licensee or registrant should be required to report his actions in writing to effect compliance to the Department. Detailed and accurate inspection reports should be maintained.

(b) Enforcement actions should be such as to insure complete compliance with appropriate state regulations and accepted standards of safe procedure.

3. Inspection Schedule

A periodic inspection system based upon hazard priority should be established and adhered to for radioactive materials licenses. It should be modified in the light of experience with individual licensees and should undergo frequent evaluation to stay abreast of program needs.

~~18~~

Priority 1 - Reinspection frequency every six months or less.

Categories

A. Broad licenses (academic and medical)

B. Licensees authorized to strip and/or paint radioactive dials.

C. Any licensee found to have serious health and safety noncompliances on a previous inspection, or any licensee which the section chief feels should be reinspected at this frequency.

Original inspections of new licenses to be made within six (6) months of date of issuance.

Priority 2 - Reinspection frequency every 12 months.

Categories

A. Well loggers*

B. Small colleges and universities.

C. Industrial radiographers performing temporary job site radiography.

D. Large medical institutions.

E. Any licensee which the radiological health program director feels should be inspected more frequently.

F. Manufacturers and/or distributors of sealed sources and devices.

*This category should drop to Priority 3 following completion of inspection of this class of licensee. Particular well loggers can be retained on this reinspection frequency, or more frequently, if so required.

Priority 2 (cont.)

Original inspections of new licenses to be made within twelve (12) months of date of issuance,

Priority 3 - Reinspection frequency every 24 months.

Categories

A. In-house industrial radiography operations.

B. Private practice medical licenses (except licenses authorizing short lease of radium only).

C. Industrial licensees using unsealed radioactive materials.

Original inspection of new licenses to be made within twelve (12) months of date of issuance.

Priority 4 - Reinspection frequency every 36 months or more.

Categories

A. Medical laboratories performing in-vitro tests only and veterinarians,

B. Private physicians authorized to possess radium on short term lease only.

C. Industrial licenses for gauges.

D. Gas chromatograph licenses.

E. Teletherapy machines not incorporated into other medical licenses.

F. Other sealed source licenses 20
(e.g. civil defense).

G. Industrial licenses authorizing installation, servicing, maintenance, etc.,of devices containing radioactive material.

H. Licenses not elsewhere classified (e.g. leak test licenses, demonstration of products licenses, transfer of products containing radioactive material, etc.)

Original inspection of new licenses to be made within 24 months of date of issuance.

Priority 5 - Reinspection frequency - "Catch as catch can" basis.

Categories

A. Out-of-state licensees in-state temporarily.

B. All general licensees.

No original inspection requirements.

D. NON-IONIZING RADIATION

a. Personnel

1. There should be at least one man-equivalent per State or one to two man-equivalents per 1000 sources.

2. Qualifications:

Individuals should be oriented in the field of radiological sciences.

b. Equipment 21

1. Each professional engaged in electronic products control activities should have a microwave power density survey meter.

2. The program should have at least one laser detector, UV and visible light detector, sound level meter, RF meter and and other instruments that may be needed for special measurements.

3. There should be a system for calibration and servicing of each instrument on a planned schedule. Calibration should be done by competent state personnel using their own calibration techniques, equipment and procedures or a commercial instrument calibration and repair service under a contact. Such calibration and servicing should be the responsibility of one member of the program staff. Each instrument should bear a tag stating the latest date of servicing and calibration and a calibration curve or correction factors for each detection range.

4. The state should select and/or develop standardized measurement methodology.

c. Activities

1. Source location

A systemized electronic product source location survey should be made to locate and identify all such sources.

2. Compliance inspection ~~22~~

A priority system should be established whereby a hazard evaluation priority associated with different product categories will be made. A next step should be a field hazard evaluation of associated hazards to determine compliance with permissible levels of radiation exposure. Enforcement actions shall be such as to insure compliance with appropriate state regulations and accepted standards of safe procedure.

3. Standards

Performance standards should be adopted according to P. L. 90-602 after which rules and regulations shall be promulgated.

4. Inspection schedule

A periodic inspection system based upon hazard priority shall be established and adhered to.

* U. S. GOVERNMENT PRINTING OFFICE : 1970-- 416-617/102

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